Technical Bulletin, Storing Archive Data Within the Flow Computer

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NOTE: User Manual Reference – This Technical Bulletin complements the information contained in Volume 2 and Volume 3, and is applicable to all firmware revisions 74+.

This bulletin was previously published as an appendix to user manuals of firmware revisions Version .74 and earlier.

Data Archiving – The archiving feature allows you to store raw data, ASCII text data and historical reports.

Table of Contents

Figures

Scope

All firmware revisions of OMNI 6000/OMNI 3000 Flow Computers have the archiving feature. This feature allows you to archive raw data, ASCII data and historical reports.

Abstract

The flow computer provides three distinct methods of storing data as follows:

- **Raw Data Archive**: Data Records are defined in raw binary format in circular files of 'n' records per file. Ten user configurable files are provided as well as an alarm file and audit trail file. This data can be retrieved using standard Modbus Function Codes 3 and 6.
- **Text Archive Data**: ASCII data which is captured and saved whenever a Snapshot, Daily, Batch End or Prove report is printed. Data is stored chronologically, to retrieve this data you must use OmniCom, OmniView, Modbus Tester or a custom Modbus driver which understands the proprietary OMNI Modbus Function Codes 64 and 65.
- **Historical Reports**: These are exact copies of data that was sent to the local printer in ASCII format. The flow computer stores the last eight copies of each, of the following reports:
  - Daily
  - Batch End
  - Prove

NOTE: Historical Reports Method is limited to storing the last eight reports and is therefore not considered archive data. Therefore this chapter will be limited to describing how Methods 1 and 2 are used to store archive data within the flow computer.

Definitions & Terminology

Archive Address – A unique Modbus® address used to read a data record from an archive file. These addresses are in the 700 series; i.e., 701, 702, 703, etc.

Archive Record – A structure containing a fixed set of data variables, which cannot exceed 250 bytes in length. Data within the record can be of any valid data type in any order.

Archive Trigger Boolean – The actual event, which causes the flow computer to capture and store a record within the archive file. The trigger can be any Boolean variable within the database including the result of a Boolean statement.

Block Read - Modbus® protocol block read requires that Function Code 03 (read multiple registers) be used to retrieve data.

Circular Archive File – A file of 'n' records arranged as a circular buffer which always contains the most recent 'n' records; i.e., the oldest data record is overwritten by each new record as it is added.

Current Record Pointer – A 16-bit read-only integer register containing a number between 0 and 'n'. Representing the position of the most recently added record within the archive file. The pointer is adjusted after each complete record is added. A value of 0 indicates that no data records have been added since the last initialization of the archive memory.

Maximum Records Register – A 16-bit read-only integer which contains the number 'n', indicating the maximum number of records within the archive file.

Requested Record Pointer – A 16-bit read/write integer used to select a specific record within an archive file.

Valid Data Types that can be configured for an archive

- 32-bit IEEE floating point data
- 32-bit long integer data 16-bit integer data
- 8-byte or 16-byte ASCII string data
- Byte packed Boolean status data

Raw Data Archiving

A maximum of ten ***archive files*** can be user configured. Two additional archive files, the alarm archive and audit trail archive are also included but are fixed in format and cannot be user configured.

Each user configurable archive file consists of 'n' ***archive records***, where 'n' is defined by the user. A record consists of a ***time and date stamp*** followed by a number of user-defined variables of any ***valid data type*** as described by its archive record definition table. The amount of memory an archive consumes is calculated by multiplying the record size in bytes times the number of records in the archive. Associated with each archive file is an ***archive trigger Boolean***. Data is captured and stored in each of the archive files whenever the appropriate trigger occurs; e.g., at the end of a batch or beginning of the day, etc. Three additional registers per archive file serve to indicate (a) maximum number of records, (b) current record pointer and (c) requested record to read pointer.

Retrieving Data

There are two methods that can be used when reading data from the archive file.

Method 1 - is a two step operation

Step 1 - involves selecting the number of the record to be read by first writing to the requested record pointer.

Step 2 - is a Modbus function code 3 read of the archive register. The 'number of points required' field in the polling message is ignored as the poll always returns the complete contents of the selected record.

Method 2 - is a more efficient single step operation where the data is read using a Modbus function code 3 read with the number of the required record included in the 'number of points required' field of the poll.

To speed up searches for a specific record within the archive file, polls directed to a second associated Modbus address for each archive file will return only the date and time fields of the selected record.

Each archive file is provided with four Modbus addresses in the database to differentiate 1) which retrieval method is being used to retrieve the data, and 2) whether the complete data record is required or just the record date and time fields.

Raw Data Archive Point Addresses

Archive #1	Complete Data Record (Method 1)	Read Only	0701
	Complete Data Record (Method 2)	Read Only	0721
	Record Date/Time Only (Method 1)	Read Only	0751
	Record Date/Time Only (Method 2)	Read Only	0771
	Maximum # of Records	Read Only	3701
	Last Record Updated Pointer	Read Only	3702
	Requested Record Pointer	Read/Write	3703
Archive #2	Complete Data Record (Method 1)	Read Only	0702
	Complete Data Record (Method 2)	Read Only	0722
	Record Date/Time Only (Method 1)	Read Only	0752
	Record Date/Time Only (Method 2)	Read Only	0772
	Maximum # of Records	Read Only	3704
	Last Record Updated Pointer	Read Only	3705
	Requested Record Pointer	Read/Write	3706
Archive #3	Complete Data Record (Method 1)	Read Only	0703
	Complete Data Record (Method 2)	Read Only	0723
	Record Date/Time Only (Method 1)	Read Only	0753
	Record Date/Time Only (Method 2)	Read Only	0773
	Maximum # of Records	Read Only	3707
	Last Record Updated Pointer	Read Only	3708
	Requested Record Pointer	Read/Write	3709

Archive #4	Complete Data Record (Method 1)	Read Only	0704
	Complete Data Record (Method 2)	Read Only	0724
	Record Date/Time Only (Method 1)	Read Only	0754
	Record Date/Time Only (Method 2)	Read Only	0774
	Maximum # of Records	Read Only	3710
	Last Record Updated Pointer	Read Only	3711
	Requested Record Pointer	Read/Write	3712
Archive #5	Complete Data Record (Method 1)	Read Only	0705
	Complete Data Record (Method 2)	Read Only	0725
	Record Date/Time Only (Method 1)	Read Only	0755
	Record Date/Time Only (Method 2)	Read Only	0775
	Maximum # of Records	Read Only	3713
	Last Record Updated Pointer	Read Only	3714
	Requested Record Pointer	Read/Write	3715
Archive #6	Complete Data Record (Method 1)	Read Only	0706
	Complete Data Record (Method 2)	Read Only	0726
	Record Date/Time Only (Method 1)	Read Only	0756
	Record Date/Time Only (Method 2)	Read Only	0776
	Maximum # of Records	Read Only	3716
	Last Record Updated Pointer	Read Only	3717
	Requested Record Pointer	Read/Write	3718
Archive #7	Complete Data Record (Method 1)	Read Only	0707
	Complete Data Record (Method 2)	Read Only	0727
	Record Date/Time Only (Method 1)	Read Only	0757
	Record Date/Time Only (Method 2)	Read Only	0777
	Maximum # of Records	Read Only	3719
	Last Record Updated Pointer	Read Only	3720
	Requested Record Pointer	Read/Write	3721
Archive #8	Complete Data Record (Method 1)	Read Only	0708
	Complete Data Record (Method 2)	Read Only	0728
	Record Date/Time Only (Method 1)	Read Only	0758
	Record Date/Time Only (Method 2)	Read Only	0778
	Maximum # of Records	Read Only	3722
	Last Record Updated Pointer	Read Only	3723
	Requested Record Pointer	Read/Write	3724
Archive #9	Complete Data Record (Method 1)	Read Only	0709
	Complete Data Record (Method 2)	Read Only	0729
	Record Date/Time Only (Method 1)	Read Only	0759
	Record Date/Time Only (Method 2)	Read Only	0779
	Maximum # of Records	Read Only	3725
	Last Record Updated Pointer	Read Only	3726
	Requested Record Pointer	Read/Write	3727
Archive #10	Complete Data Record (Method 1)	Read Only	0710
	Complete Data Record (Method 2)	Read Only	0730
	Record Date/Time Only (Method 1)	Read Only	0760
	Record Date/Time Only (Method 2)	Read Only	0780
	Maximum # of Records	Read Only	3728
	Last Record Updated Pointer	Read Only	3729
	Requested Record Pointer	Read/Write	3730

Alarm Archive	Complete Data Record (Method 1)	Read Only	0711
	Complete Data Record (Method 2)	Read Only	0731
	Record Date/Time Only (Method 1)	Read Only	0761
	Record Date/Time Only (Method 2)	Read Only	0781
	Maximum # of Records	Read Only	3731
	Last Record Updated Pointer	Read Only	3732
	Requested Record Pointer	Read/Write	3733
Audit Archive	Complete Data Record (Method 1)	Read Only	0712
	Complete Data Record (Method 2)	Read Only	0732
	Record Date/Time Only (Method 1)	Read Only	0762
	Record Date/Time Only (Method 2)	Read Only	0782
	Maximum # of Records	Read Only	3734
	Last Record Updated Pointer	Read Only	3735
	Requested Record Pointer	Read/Write	3736

Archive Date and Time Format

The first six bytes of each archive record retrieved represents the date and time that it was recorded. The date format is as it is configured either MM/DD/YY or DD/MM/YY. The month ranges from 1-12, day from 1-31, year from 0-99, hour from 0-23, minute from 0-59, and seconds from 0-59.

For Example: consider a date and time of August 29, 2007 11:36:52:

If your date format is "MM/DD/YY", the first six bytes in hexadecimal would be

08 1D 07 0B 24 34

If your date format is “DD/MM/YY”, the first six bytes in hexadecimal would be

1D 08 07 0B 24 34

Retrieving Text Archive Data Including Alarm and Audit Trail Logs Using OmniCom

Retrieving Text Archive Data Using OmniCom

NOTE: In revision 2x.74 and above. OMNI converts packet number to 0 to 63 even if OmniCom asks for 64 and above.

In revisions below 2x.74, OMNI expects the packet number to be 0 – 63.

For use with OMNI Revisions below 2x.7:

Step 1. OmniCom writes ‘archive data start’ to Modbus index 15128 using YY/DD/MM format.

Step 2. OmniCom writes ‘number of days’ archive to retrieve’ to Modbus index 15127.

Step 3. OmniCom reads 15127.
If 15127 = minus number go to step 4
If not go to step 3

Step 4. OmniCom sets packet number = 0.

Step 5. OmniCom reads Modbus index 9402 with the current packet number using function code 65.
If ‘1A’ is received, go to step 7,
If you receive packet number = packet +1, and packet number >=64 go to step 6,
If you receive anything else go to step 5.

Step 6. OmniCom reads 15127, if 15127 = positive number, write this number to 15127, go to step 3 archive retrieving.

For use with OMNI Revisions 2x.74 and above:

Step 1. OmniCom writes 'archive data start' to Modbus index 15128 using YY/DD/MM format.

Step 2. OmniCom writes 'number of days required' to Modbus index 15127.

Step 3. OmniCom reads 15127.
If 15127 = minus number go to step 4.
If not go to step 3

Step 4. OmniCom sets packet number = 0.

Step 5. OmniCom reads Modbus index 9402 with the current packet number using function code 65.
If '1A' is received, go to step 7,
If not packet number = packet number + 1.

Step 6. OmniCom reads 15127
If 15127 = positive number, write this number to 15127 and go to step 3.
If not go to step 5

Step 7. OmniCom writes a 999 to Modbus index 15127 to terminate text archive retrieving.

Reading the Historical Audit Trail from an OMNI using OmniCom

Step 1. OmniCom writes the number of audit events to be retrieved to Modbus register 3769 (Minimum 1, maximum 150). The OMNI will send the maximum number of events available in cases where the number asked for exceeds the number available.

Step 2. OmniCom writes the appropriate bit to Modbus index 15129 command word to initiate the transfer process.

Step 3. OmniCom continually reads 15129 until the target bit is set to zero by the OMNI indicating that the command is recognized and the buffer is filled.

Step 4. OmniCom initializes the packet number to zero.

Step 5. Using function code 65, OmniCom reads the 9042 text buffer using the current packet number.

If the retrieved text contains "EOF" (1A hex), go to step 6. If the packet number = packet number +1, there is no need to limit the packet number to 64. Repeat step 5.

Step 6. The audit trail retrieval process is complete

Reading the Historical Alarm Log using OmniCom

NOTE: **Firmware revisions 2x.74 and above store a maximum of 500 alarm events.

Firmware revisions below 2x.74 store 150 alarm events.

Step 1. OmniCom writes the number of historical alarm events to be retrieved to Modbus register 3769 (minimum 1, maximum 500**). The OMNI will send the maximum number of events available in cases where the number asked exceeds the number available.

Step 2. OmniCom writes a '1' to the appropriate bit in the 15129 command word to initiate the transfer process.

Step 3. OmniCom continually reads 15129 until the target bit is set to zero by the OMNI indicating that the command is recognized and the buffer is filled.

Step 4. OmniCom initializes the packet number to zero.

Step 5. Using function code 65, OmniCom reads the 9042 text buffer using the current packet number.

If no response is obtained, a 64-packet boundary has been reached and the OMNI is refilling the buffer (3 second maximum delay). The buffer read should be retried.

If the retrieved text contains 'EOF' (1A hex), go to step 6

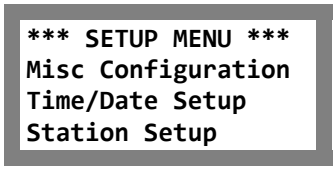
If the retrieved text contains packet number = packet number + 1, there is no need to limit the packet number to 64. Repeat step 5

Step 6 The alarm retrieval process is complete.

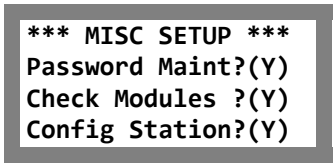
Archive Configuration Changes

Archive configuration changes can be made via OmniCom or directly from the keypad of the flow computer. As the OmniCom program includes extensive help screens, which document this subject, this appendix will concentrate on configuring the archive features via the keypad.

From the Display Mode press **[Prog] [Setup] [Enter]**. The LCD screen displays



Select **'Misc. Configuration**' and press **[Enter]**. The following displays



Select '**Password Maint**' and press **[Enter]**. Enter the privileged password when prompted and scroll down the screen until the following is displayed:

Setting the 'Reconfig Archive' Flag

Any configuration changes that are made to ***any*** of the archive files such as changes to the size or number of records will force the flow computer to reallocate and clear to zero the RAM memory used to store archive data. To avoid accidental data loss, the flow computer requires that two entries are manipulated correctly before changes to the archive configuration can be made.

The '**Reconfig Archive**' flag must be set to '**Y**' and the **Archive Run**' flag must be set to '**N**'.

Possible Loss of Data when Starting and Stopping the Archive

To conserve archive storage, the user may on some occasions wish to set the '**Archive Run**' flag to 'N'. This can be done at any time without loss of existing data as long as the '**Reconfig Archive**' flag is not set to '**Y**'. If the '**Reconfig Archive**' flag is accidentally set to '**Y**' no data will be lost until the '**Archive Run**' flag is set to '**Y**' (this allows the user to retrieve data before it is lost).

Defining the Archive Records

After setting the '**Reconfig Archive**' flag to '**Y**' as described above, press the **[Prog]** key once to return to the 'Misc Setup' menu. It will be possible to define or change any archive file configuration by scrolling down the display until the following screen is displayed:

Enter a number between **1** and **10** to select a specific archive file to modify (1 for example). The following screen will display:

```
ARCHIVE 701 RECORD
#1 Index          0
#1 Points         0
#2 Index          0
#2 Points         0
```

Begin entering the data that you require to be archived. The example below will cause variables 7101, 7102, 7103, 5101, 5102 and 5103 to be archived.

NOTE: The 'Alarm' and 'Audit Trail' archive files are in a fixed format and cannot be changed.

```
ARCHIVE 701 RECORD
#1 Index       7101
#1 Points         3
#2 Index       5101
#2 Points         3
```

A maximum of 16 groups of variables may be included in an archive record. Data can be of any valid type. The record is limited to a total of 250 data bytes remembering that the time and date stamp included in each record occupies 6 bytes. Scrolling down the screen displays the following:

```
ARCHIVE 701 RECORD
Max Records       0
Trig Boolean      0
```

Enter the maximum number of archive records to be contained within this **circular archive file**.

NOTE: Circular Archive File – A file of 'n' records arranged as a circular buffer which always contains the most recent 'n' records; i.e., the oldest data record is overwritten by each new record as it is added.

At the '**Trig Boolean**' entry, enter the database address of the Boolean trigger that will cause the flow computer to store the archive data record. For example, entering 1831 (the 'hour start' flag) would cause the flow computer to store data at hourly intervals.

Once you have entered all the necessary data for all of the archive records return to the following screen, which is in the 'Password Maintenance' menu.

```
Reconfig Archive?Y
Archive Run (Y/N)N
```

NOTE: Redefining the archive Boolean trigger does not cause the archive RAM to be cleared.

Set '**Reconfig Archive**' to '**N**' and '**Archive Run**' to '**Y**'. At this point the flow computer will reinitialize archive RAM memory and attempt to allocate memory as configured.

How the Available Memory Is Allocated in the CPU Versions

On EPROM version CPU with Plug in RAM approximately 250,000 bytes of memory are available for the storage of archived data; this includes 'Raw Data' and 'ASCII Text Data'. Archive memory is allocated dynamically, i.e. the memory required to satisfy the 'Raw Data Archive' is allocated first, one archive file at a time. The memory remaining after the Raw Data Archive files are setup is what is used by the Text Archive described later.

EPROM issued CPU's with SMT RAM have approximately 750,000 bytes of memory available.

The flash CPU has approximately 2 Mbytes of RAM available.

Estimating the Available Tex Archive RAM

The amount of archive RAM available to store text reports depends upon how much RAM is used to store raw binary data in archives 701 through 710. The status of allocated RAM is available using OmniCom or is accessible via the flow computer's front panel.

Using OmniCom, connect to the flow computer, select the Operate mode in the Action drop-down of the toolbar, and select Archive Maintenance. The amount of RAM allocated to Text is displayed, together with the amount of RAM allocated to each of the raw data archive files (701 through 710).

To estimate the number o test reports that can be store before the oldest gets overwritten, divide the total number of bytes allocated to Text by the size of the report in bytes. Note that a typical OMNI default report containing data for 4 meter runs is approximately 5000 bytes.

Viewing the Archive File Memory Status Screens

NOTE: The number of files allocated changes depending on how many archive files have been configured.

The 'Archive File Memory Status' screens display automatically whenever the user attempts to re-start data archiving for the first time after reconfiguring the archive structure. These screens can also be accessed at any time by pressing 'Setup' 'Status' 'Display' while in the display mode. A correctly configured archive structure is indicated by the following screen

```
ARCHIVE FILE STATUS
Archive Memory   OK
Files Allocated   3
```

An incorrectly configured archive structure is indicated by the following screen.

```
ARCHIVE FILE STATUS
Archive MemoryError
Files Allocated   3
```

Archive memory errors are caused when RAM memory is insufficient for the number and size of archive files configured. In this case the 'Start Archive' command is ignored and the flow computer allocates memory to as many archive files as possible. The number on the 'Files Allocated' line of the display shows how many files were allocated before the memory ran out.

Scroll down the screen to see the actual number of bytes allocated to each archive file. All remaining memory not allocated to the 'Raw Data Archive Files' is allocated to the 'Text Archive' buffer. The display below is typical.

```
ARCHIVE FILE STATUS
709 ArcSize   10000
710 ArcSize    8192
TextArcSize  100256
```

Summary of Raw Data Archiving Features

Ten independent archive files are available for user configuration.

Two additional archive files, the 'alarm event log' and 'audit trail log' are provided.

Archive files consist of multiple records in a circular array.

Mixed types of variable data can be stored in records of 250 bytes maximum.

Except for the 'alarm log' and 'audit trail log' content and maximum number of records in an archive file are configurable.

Data is read in block form one record at a time.

Each archive has a unique address (701, 702, 703, etc.).

Each archive has a set of integer registers used to indicate most current record pointer, maximum number of records, and required record pointer.

Data is captured and stored in an archive file whenever the appropriate trigger event occurs.

Multiple archive files can be controlled by the same trigger event.

Empty archive records contain binary 0’s / ASCII Null characters.

To avoid errors, host devices reading archive data should dynamically determine the record pointer roll over value based on the number of record integers read each time from the flow computer.

Any configuration changes made to the archive setup such as redefinition of any record or change in the number of records within any archive will cause all data stored in the entire archive system to be reset. To prevent accidental erasure of all archived data the user must first halt all archiving by setting the ‘Archive Run/Halt Flag' to false (0), and setting the 'Config Archive Flag' to true (1).

Raw Data Archive Definition: Alarm/Event Log and Audit Event Log

Alarm/Event Log Record Structure: Archive File Address 711

NOTE: Alarm types are:

0 = Log event, sound beeper and display in LCD any edge change in bit identified by field #3.

1 = Log event, sound beeper and display in LCD rising edge changes in bit identified by field #3.

2 = Even log any edge change in bit identified by field #3. No beeper or LCD displays action.

3 = Event log rising edge changes in bit identified by field #3. No beeper or LCD displays action.

Rising edge change means 0 to 1 transition.

Field #1	3-Byte Date	(MM, DD, YY or DD, MM, YY)
Field #2	3-Byte Time	(HH, MM, SS)
Field #3	16-bit Integer	(Modbus Index # of alarm or event)
Field #4	1 Byte	(Alarm Type - see sidebar)
Field #5	1 Byte	(Boolean Value, 1 or 0 representing Alarm or OK)
Field #6	IEEE Float	(Value of transducer variable at the time of alarm or event)
Field #7	32-bit Integer	(Volume totalizer at time of event or alarm)
Field #8	32-bit Integer	(Mass totalizer at the time of the event or alarm)

NOTE: Liquid Turbine/PD Meter with Meter Factor Curve firmware revisions (22/26) do not support the Modbus Index field.

Audit Event Log Record Structure: Archive File Address 712

NOTE: Field 5 and 6 are set to 0.0 when the variable type change is String. Fields 7 and 8 contain null characters when the variable type changed is NOT a string. When fields 7 and 8 contain 8 character strings the remaining 8 characters are padded with nulls.

Field #1	3-Byte Date	(MM, DD, YY or DD, MM, YY)
Field #2	3-Byte Time	(HH, MM, SS)
Field #3	16-bit Integer	(Event number, increments for each event, rolls at 65535)
Field #4	16-bit Integer	(Modbus index of variable changed)
Field #5	IEEE Float	(Numeric variable value before change - old value)
Field #6	IEEE Float	(Numeric variable value after change - new value)
Field #7	16-Char ASCII	(String variable value before change - old value)
Field #8	16-Char ASCII	(String variable value after change - new value)
Field #9	32-bit Integer	(Volume totalizer at time of change)
Field #10	32-bit Integer	(Mass totalizer at the time of the change)

NOTE: Liquid Turbine/PD Meters with Meter Factor Curve firmware revisions (22/26) do not support the Volume and Mass Totalizer fields.

Raw Data Archive Definition: Detailed Daily Report (Rev 23 Only)

Users with firmware revision 23 can select a Detailed Daily report within the OMNI Configuration under the Archive 701 record and once selected the Archive registers 701-705 will be automatically configured with data that the Detailed Daily Report requires.

The user only has to calculate the number of records required to be archived. For example, a user wants seven days of detailed data.

24 hourly data records x 7 = 168 records

The user enters 168 records in each Archive 701-705.

The Archive register 701-705 are configured as follows:

Archive 701

Boolean Trigger 2141 (Meter 1 Hourly Archive break flag)

Max Records (User Entry) per Table 1.

Table 1. Boolean Trigger 2141

Packet	Point	Point Count	Data Type	Description
1	3118	1	16-bit inter	Meter 1 Previous Hour Flow Time
2	8518	6	Float	Meter 1 Prev. Hour Avg Saturated HV
				Meter 1 Prev. Hour Avg Z
				Meter 1 Prev. Hour Avg Temperature
				Meter 1 Prev. Hour Avg Pressure
				Meter 1 Prev. Hur Avg DP
				Meter 1 Prev. Hour Avg Density
3	8526	2	Float	Meter 1 Previous Hour Avg Ref SG
				Meter 1 Prev. Hour Avg HV
4	8529	1	Float	Meter 1 Prev. Hourly Avg Flow Factor
5	8565	1	Float	Meter 1 Previous Hour Avg Fww6
6	5175	3	32-bit integer	Meter 1 Previous Hourly Net Total
				Meter 1 Previous Hourly Mass Total
				Meter 1 Previous Hourly Energy
7	5186	1	32-bit integer	Meter 1 Hr. Saturated Net Total

Archive 702

Boolean Trigger 2241 (Meter 2 Hourly Archive break flag)
Max Records (User Entry) per Table 2.

Table 2. Boolean Trigger 2241

Packet	Point	Point Count	Data Type	Description
1	3218	1	16-bit integer	Meter 1 Previous Hour Flow Time
2	8618	6	Float	Meter 1 Prev. Hour Avg Saturated HV
				Meter 1 Prev. Hour Avg Z
				Meter 1 Prev. Hour Avg Temperature
				Meter 1 Prev. Hour Avg Pressure
				Meter 1 Prev. Hour Avg DP
				Meter 1 Prev. Hour Avg Density
3	8626	2	Float	Meter 1 Previous Hour Avg Ref SG
				Meter 1 Prev. Hour Avg HV
4	8629	1	Float	Meter1 Prev. Hourly Avg Flow Factor
5	8665	1	Float	Meter 1 Previous Hour Avg Fww
6	5275	3	32-bit integer	Meter 1 Previous Hourly Net Total
				Meter 1 Previous Hourly Mass Total
				Meter 1 Previous Hourly Energy
7	5286	1	32-bit integer	Meter 1 Prev. Hr. Saturated Net Total

Archive 703

Boolean Trigger 2341 (Meter 3 Hourly Archive break flag)
Max Records (User Entry) per Table 3.

Table 3. Boolean Trigger 2341

Packet	Point	Point Count	Data Type	Description
1	3318	1	16-bit integer	Meter 1 Previous Hour Flow Time
2	8718	6	Float	Meter 1 Prev. Hour Avg Saturated HV
				Meter 1 Prev. Hour Avg Z
				Meter 1 Prev. Hour Avg Temperature
				Meter 1 Prev. Hour Avg Pressure
				Meter 1 Prev. Hour Avg DP
				Meter 1 Prev. Hour Avg Density
3	8726	2	Float	Meter 1 Previous Hour Avg Ref SG
				Meter 1 Prev. Hour Avg HV
4	8729	1	Float	Meter1 Prev. Hourly Avg Flow Factor
5	8765	1	Float	Meter 1 Previous Hour Avg Fww
6	53175	3	32-bit integer	Meter 1 Previous Hourly Net Total
				Meter 1 Previous Hourly Mass Total
				Meter 1 Previous Hourly Energy
7	5386	1	32-bit integer	Meter 1 Prev. Hr. Saturated Net Total

Archive 704

Boolean Trigger 2441 (Meter 4 Hourly Archive break flag)
Max Records (User Entry) per Table 4.

Table 4. Boolean Trigger 2441

Packet	Point	Point Count	Data Type	Description
1	3418	1	16-bit integer	Meter 1 Previous Hour Flow Time
2	8818	6	Float	Meter 1 Prev. Hour Avg Saturated HV
				Meter 1 Prev. Hour Avg Z
				Meter 1 Prev. Hour Avg Temperature
				Meter 1 Prev. Hour Avg Pressure
				Meter 1 Prev. Hour Avg DP
				Meter 1 Prev. Hour Avg Density
3	8826	2	Float	Meter 1 Previous Hour Avg Ref SG
				Meter 1 Prev. Hour Avg HV
4	8829	1	Float	Meter1 Prev. Hourly Avg Flow Factor
5	8865	1	Float	Meter 1 Previous Hour Avg Fww
6	5475	3	32-bit integer	Meter 1 Previous Hourly Net Total
				Meter 1 Previous Hourly Mass Total
				Meter 1 Previous Hourly Energy
7	5486	1	32-bit integer	Meter 1 Prev. Hr. Saturated Net Total

Archive 705

Boolean Trigger 1831 (Hour Start Flag)
Max Records (User Entry) per Table 5.

Table 5. Boolean Trigger 1831

Packet	Point	Point Count	Data Type	Description
1	18101	21	Float	Product #1 Previous Hour Avg Mol %

To Print out a Detailed Daily Report use the front panel keys by pressing “Program” “Print” and “Enter” and scroll down to:

```
* PRINT REPORT MENU*
Meter n Detail Rpt 1
Report Date 04/26/09
Print Detail Rpt ?
```

A typical Detailed Daily Report is shown in Figures 1 and 2.

pppppp

Omni Flow Computers, Inc
Detailed Daily Report Bank 23

Starting report 05/01/2009 04:00:00 AM
Ending report 05/02/2009 04:00:00 AM
Time of Printing 05/04/2009 02:19:56 PM

Meter ID Meter 1
Computer ID App 23

Viscosity cp .012000
Isentropic Expansion .000 Std. Air Density lb/cu ft .076321 Avg.H2O Content lb/MMSCF .00
Base Temp Deg.F 60.0 Base Pressure psi 14.73 Atmospheric Pressure psi 14.696
Average Method Time Weighted Total G.C. cycles 0 Total Good G.C. cycles 0

Time Period	Flow Time Seconds	Avg T Deg F	Avg P psig	Raw Counts	Avg Density lb/ft3	S.G.	Zf	GHV Btu/scf	Std Vol MMSCF	Mass Klb	Energy MMBTU
04:00-05:00	3600.0	.0	.0	13886711	.04839	.5603	.997032	1000.000	.125432	5.376	125.433
05:00-06:00	3600.0	.0	.0	13886532	.04839	.5603	.997032	1000.000	.125431	5.376	125.430
06:00-07:00	3600.0	.0	.0	13886690	.04839	.5603	.997032	1000.000	.125432	5.375	125.432
07:00-08:00	3600.0	.0	.0	13886782	.04839	.5603	.997032	1000.000	.125432	5.376	125.433
08:00-09:00	3600.0	.0	.0	13886624	.04839	.5603	.997032	1000.000	.125432	5.376	125.431
09:00-10:00	3600.0	.0	.0	13885471	.04839	.5603	.997032	1000.000	.125421	5.375	125.421
10:00-11:00	3600.0	.0	.0	13885422	.04839	.5603	.997032	1000.000	.125420	5.376	125.421
11:00-12:00	3600.0	.0	.0	13885296	.04839	.5603	.997032	1000.000	.125420	5.375	125.419
12:00-13:00	3600.0	.0	.0	13885279	.04839	.5603	.997032	1000.000	.125419	5.375	125.419
13:00-14:00	3600.0	.0	.0	13885041	.04839	.5603	.997032	1000.000	.125417	5.375	125.417
14:00-15:00	3600.0	.0	.0	13884876	.04839	.5603	.997032	1000.000	.125415	5.375	125.416
15:00-16:00	3600.0	.0	.0	13884980	.04839	.5603	.997032	1000.000	.125417	5.375	125.416
16:00-17:00	3600.0	.0	.0	13885053	.04839	.5603	.997032	1000.000	.125417	5.375	125.418
17:00-18:00	3600.0	.0	.0	13885233	.04839	.5603	.997032	1000.000	.125419	5.376	125.418
18:00-19:00	3600.0	.0	.0	13885490	.04839	.5603	.997032	1000.000	.125421	5.375	125.421
19:00-20:00	3600.0	.0	.0	13885570	.04839	.5603	.997032	1000.000	.125422	5.375	125.422
20:00-21:00	3600.0	.0	.0	13885761	.04839	.5603	.997032	1000.000	.125423	5.376	125.424
21:00-22:00	3600.0	.0	.0	13885989	.04839	.5603	.997032	1000.000	.125426	5.375	125.425
22:00-23:00	3600.0	.0	.0	13886136	.04839	.5603	.997032	1000.000	.125427	5.376	125.427
23:00-00:00	3600.0	.0	.0	13886292	.04839	.5603	.997032	1000.000	.125428	5.375	125.429
Date : 05/02/2009											
00:00-01:00	3600.0	.0	.0	13886283	.04839	.5603	.997032	1000.000	.125429	5.376	125.428
01:00-02:00	3600.0	.0	.0	13886301	.04839	.5603	.997032	1000.000	.125428	5.375	125.428
02:00-03:00	3600.0	.0	.0	13886518	.04839	.5603	.997032	1000.000	.125430	5.376	125.431
03:00-04:00	3600.0	.0	.0	13886547	.04839	.5603	.997032	1000.000	.125431	5.376	125.431
Daily Minimum		.0	.0	0	.00000	.0000	.000000	.000			
Daily Maximum		.0	.0	0	.00000	.0000	.000000	.000			
Daily Time Averages		.0	.0	0	.00000	.0000	.000000	.000			

Daily Total - Std Vol MMSCF .0000000
Daily Total - Mass Klbs .000
Daily Total - Energy MMBTU .000

Figure 1. Detailed Daily Report

Omni Flow Computers, Inc
Detailed Daily Report Bank 23

Starting report 05/01/2009 04:00:00 AM
Ending report 05/02/2009 04:00:00 AM
Time of Printing 05/04/2009 02:19:56 PM

Product Name Nat I
Computer ID App

Time Period Beginning Hour	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00
Ending Hour	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00
Mole% Methane	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000
Mole% Nitrogen	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000
Mole% Carbon Dioxide	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000
Mole% Ethane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% Propane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% i-Butane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% n-Butane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% i-Pentane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% n-Pentane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Time Period Beginning Hour	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00	01:00	02:00	03:00
Ending Hour	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00	01:00	02:00	03:00	04:00
Mole% Methane	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000	99.0000
Mole% Nitrogen	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000	.8000
Mole% Carbon Dioxide	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000
Mole% Ethane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% Propane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% i-Butane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% n-Butane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% i-Pentane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Mole% n-Pentane	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Figure 2. Detailed Daily Report

Using the Custom Reports to Access the Text Archive Feature

The actual data which will be archived in the 'Text Archive' buffer is identified within the body of a 'User Custom Report Template'. This is done by enclosing the data in question between braces '{}' and preceding the opening brace '{' character with either Boolean 1000 (archive the data identified between the braces) or Boolean 2000 (print and archive the data identified between the braces). In the example 'Batch End' report shown in Figure 3, the first half of the report will be printed and stored in the 'Text Archive' while the second half of the report will not print but will be stored in the 'Text Archive'.

NOTE: Data is archived only when the report is processed for the first time. Reprinting a stored report does not cause any data to be stored in the archive.

```
X{                                Company Name
Batch Report

Date :   XX/XX/XX    Time : XX:XX:XX          Computer ID :  XXXXXXX

Meter ID                       XXXXXXXX        XXXXXXXX        XXXXXXXX
Product ID                     XXXXXXXX        XXXXXXXX
API Table Selected             XXXXXXXX        XXXXXXXX
Batch Start Date               XX/XX/XX        XX/XX/XX
Batch Start Time               XX:XX:XX        XX:XX:XX
Batch End Date                 XX/XX/XX        XX/XX/XX
Batch End Time                 XX:XX:XX        XX:XX:XX
Batch Gross (IV) BBL          XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Batch Net (GSV) BBL           XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Batch Mass LB                 XXXXXXXXX       XXXXXXXXX       XXXXXXXXX}
X{
Opening Gross (IV) BBL        XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Opening Net (GSV) BBL         XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Opening Mass LB               XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Closing Gross (IV) BBL        XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Closing Net (GSV) BBL         XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Closing Mass LB               XXXXXXXXX       XXXXXXXXX       XXXXXXXXX
Batch Flow Weighted Averages:
Gross Flow (IV) BBL/HR         XXXXXX.X         XXXXX.X
Temperature Deg.F              XXXXXX.X         XXXXX.X
Pressure PSIG                  XXXXXX.X         XXXXX.X
Flowing Density GM/CC          XXXXXX.X         XXXXX.X
API @ 60 Deg.F                 XXXXXX.X         XXXXX.X
VCF                              X.XXXX           X.XXXX
CPL                              X.XXXX           X.XXXX
Meter Factor                     X.XXXX           X.XXXX
}
```

Figure 3. Batch End Report

NOTE: The user has embedded a Boolean point address 2000 to indicate that the following data enclosed by the '{…}" characters is to be printed and archived.

When embedding the point, set the width=1 and number of decimal places=0.

The user has embedded a Boolean point address 1000 to indicate that the following data enclosed by the '{…}' characters is to be archived only and not printed.

When embedding the point, set the width=1 and number of decimal places =0.

The following are the template files for OmniCom for Windows® where 'XX' is replaced by the application i.e. '20' or '27':

1) '*filename*.oXXst' Snapshot Template
2) '*filename*.oXXbt' Batch Template
3) '*filename*.oXXdt' Daily Template
4) '*filename*.oXXpt' Prover Template

The following are the template files for OmniCom for DOS:

5) '*FILENAME*.TP1' Snapshot Report
6) '*FILENAME*.TP2' Batch Report
7) '*FILENAME*.TP3' Daily Report
8) '*FILENAME*.TP4' Prover Report

Custom Report Templates

A default selection of templates, are created automatically when OmniCom for Windows® is installed. They can be found in the ‘Sample Templates’ folder under the install folder.

For example, the following are some of the templates provided in the ‘Sample Templates’ folder.

Snapshot

Snapshot Report.o20st
Snapshot Report.o21st
Snapshot Report.o22st
Snapshot Report.o23st
Snapshot Report.o24st
Snapshot Report.o25st
Snapshot Report.o26st
Snapshot Report.o27st
Snapshot Report 7430.o22st
Snapshot Report 7430.o26st

Batch

Batch Report.o20bt
Batch Report.o21bt
Batch Report.o22bt
Batch Report.o23bt
Batch Report.o24bt
Batch Report.o25bt
Batch Report.o26bt
Batch Report.o27bt
Batch Report 2270.o22bt
Batch Report 7430.o22bt
Batch Report 7430.o23bt
Batch Report 7430.o26bt
Batch Report 7430.o27bt

Daily

- Daily Report.o20dt
- Daily Report.o21dt
- Daily Report.o22dt
- Daily Report.o23dt
- Daily Report.o24dt
- Daily Report.o25dt
- Daily Report.o26dt
- Daily Report.o27dt
- Daily Report 7430.o20dt
- Daily Report 7430.o22dt
- Daily Report 7430.o23dt
- Daily Report 7430.o24dt
- Daily Report 7430.o26dt
- Daily Report 7430.o27dt

Prove

- Bi-Compact Prove 7430.o22pt
- Bi-Compact Prove 7430.o26pt
- Bi-Pipe Prove 7430.o22pt
- Bi-Pipe Prove Report 7430.o26pt
- Master-Meter Prove 7430.o22pt
- Master Meter Prove 7430.o26pt
- Prove _ Coriolis Master Meter.o20pt
- Prove _ Coriolis Master Meter.o24pt
- Prove _ Gas Master Meter.o23pt
- Prove _ Gas Master Meter.o27pt
- Prove _ Master Meter.o20pt
- Prove _ Master Meter.o24pt
- Prove Pipe _ Avg Data Method.o20pt
- Prove Pipe _ Avg Data Method.o22pt
- Prove Pipe _ Avg Data Method.o24pt
- Prove Pipe _ Avg Data Method.o26pt
- Prove Pipe _ Avg MF Method.o20pt
- Prove Pipe _ Avg MF Method.o24pt
- Prove Pipe _ Mass.o22pt
- Prove Pipe _ Mass.o26pt
- Prove SVP_Avg Data Method.o20pt
- Prove SVP_Avg Data Method.o22pt
- Prove SVP_Avg Data Method.o24pt
- Prove SVP_Avg Data Method.o26pt
- Prove SVP_Avg MF Method.o20.pt
- Prove SVP_Avg MF Method.o24.pt
- Prove SVP_Coriolis Mass Method.o20pt
- Prove SVP_Coriolis Mass Method.o24pt
- Prove SVP_Visc Linearized_Mass or Volume.o20pt

Prove SVP_ Visc Linearized_Mass or Volume.o24pt
Uni-Compact Prove 7430.o22pt
Uni-Compact Prove 7430.o26pt
Uni-Pipe Prove 7430.o22pt
Uni-Pipe Prove 7430.o26pt

A default selection of files with the extension 'TP?' are created automatically when OmniCom for DOS is installed, they can be found in the 'OMNI2?' subdirectories.

For example the OMNI20 subdirectory contains the following template files:

NOTE: *To avoid duplication and conserve disk space, these templates do not have matching TP1, TP2, and TP3 templates. Select TP1 through TP3 from the appropriate set (A, B, C, or D) depending on independent or common product.

REV20A.TP1	Interval Report	Independent Products	
REV20A.TP2	Batch Report	Independent Products	
REV20A.TP3	Daily Report	Independent Products	
REV20A.TP4	Prove Report	Independent Products	Double Chronometry
REV20B.TP1	Interval Report	Independent Products	
REV20B.TP2	Batch Report	Independent Products	
REV20B.TP3	Daily Report	Independent Products	
REV20B.TP4	Prove Report	Independent Products	Normal Pipe Prover
REV20C.TP1	Interval Report	Common Product	
REV20C.TP2	Batch Report	Common Product	
REV20C.TP3	Daily Report	Common Product	
REV20C.TP4	Prove Report	Common Product	Double Chronometry
REV20D.TP1	Interval Report	Common Product	
REV20D.TP2	Batch Report	Common Product	
REV20D.TP3	Daily Report	Common Product	
REV20D.TP4	Prove Report	Common Product	Normal Pipe Prover
REV20E.TP4*****	Prove Report	Master Meter Method	
REV20M.TP4*	Prove Report	Mass Meter Proving	Normal Pipe Prover
REV20MC.TP4*	Prove Report	Mass Meter Proving	Double Chronometry
REV20LC.TP4*	Prove Report	Double Chronometry	Viscosity Linearization
REV20LP.TP4*	Prove Report	Pipe Prover	Viscosity Linearization

In OmniCom for Windows®, templates can only be accessed if they exist; i.e., if you are currently working on ***'filename.o20*** opening the custom templates will just create an empty file. You may create a set of templates by copying the appropriate sample templates.

1) At the OmniCom **Actions** menu select '**Reports**'.
2) Select a template to work on.
3) **Right-click** or at the **File** menu select '**Import Template**' or '**Import an OmniCom DOS Template File'**.
4) Edit the template
5) Save the file (at the File menu select '**Save**' or '**Save As**' to save your configuration and template files.
6) If you wish to only save the template file, use '**Export Template**' at the **File** menu or at the **right-click** menu.

In OmniCom for DOS:

1) At the OmniCom File menu select '**Shell to DOS**'.
2) Type the following to create a set of custom templates for a common product system using a full sized pipe prover (assumes Rev. 20.xx application):

COPY OMNI20\REV20D.TP? OMNI20\filename.TP?

3) Type **EXIT** to return to OmniCom.

In the above example OMNI20 is the sub directory which contains all files related to Application Revision 20. Likewise OMNI24 refers to Revision 24 applications.

DOCUMENT REVISION HISTORY

DOCUMENT INITIAL RELEASE DATE.....05-September-2003

REVISION	DATE	PURPOSE / CHANGE REQUEST
A	05-September-2003	Maintained on the Web - Initial release
B	06-July-2009	DCR 090044
C	14-July-2010	DCR 100119